

The water mite family Limnesiidae from northern and Western Australia (Acari: Actinedida), with a description of two new species

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Abstract – Two new species, *Limnesia rubra* and *Physolimnesia katherine*, are described from the Northern Territory, Australia. *Timmsilimnesia prehensens* is synonymized with *Limnesia inga*. Additional taxonomic characteristics are given for *L. parasolida* and *L. solida*. Furthermore, new records are presented from the Northern Territory and Western Australia for a number of *Limnesia* species known from other regions of Australia.

INTRODUCTION

The family Limnesiidae is represented in Australia by five genera: *Heterolimnesia*, *Limnesia*, *Physolimnesia*, *Timmsilimnesia* and *Tubophorella* (Cook, 1986). The most species-rich genus is *Limnesia*, with 25 species known from Australia so far.

Limnesiid water mites occur in nearly every lentic water of Northern Territory and Western Australia. Together with members of the genus *Arrenurus* (Smit, 1997), they belong to the most abundant water mites of these type of waters (personal observation).

In this study, two new species are described, *Limnesia rubra* and *Physolimnesia katherine*. New records are presented of *Limnesia inga* K.O. Viets, *L. lebangensis* Piersig, *L. longigenitalis* Lundblad, *L. maceripalpis* K.O. Viets, *L. parasolida* K.O. Viets, *L. solida* Lundblad and *Timmsilimnesia prehensens* K.O. Viets. *Timmsilimnesia prehensens* proved to be the male of *Limnesia inga*, a species previously known only from the female; the new name is *Timmsilimnesia inga* (K.O. Viets). Additional taxonomic characteristics are given for two previously inadequately described species, *L. parasolida* and *L. solida*.

MATERIAL AND METHODS

All material has been collected by the author. Holotypes and paratypes from the Northern Territory have been deposited in the Northern Territory Museum (Darwin) (NTM). Additional paratypes have been deposited in the Western Australian Museum (Perth) (WAM) and the Zoological Museum of the University of Amsterdam (ZMA). All non-type material has been placed in the ZMA.

Measurements of palp and leg segments are dorsal lengths. The body length is measured dorsally from unmounted specimens. Measure-

ments of paratypes are given in brackets. The following abbreviations have been used: PI-PV palp segments 1–5; I-leg-5 fifth segment of first leg.

SYSTEMATICS

Genus *Limnesia* Koch

Limnesia Koch, 1836: 19.

Limnesia (*Limnesia*) *lebangensis* Piersig

Limnesia lebangensis Piersig, 1906: 348; Walter, 1928: 73; Walter, 1929: 228; K. Viets, 1935: 607; Uchida, 1935: 121; Halik, 1941: 109; K.O. Viets, 1959: 422; Imamura, 1964: 70; Cook, 1967: 87; Lundblad, 1969: 334; Prasad, 1974: 62; K.O. Viets, 1975: 93; Bisht, 1979: 89; Khatoon and Ali, 1989: 613; Smit, 1992: 95.

Limnesia gentilis Koenike, 1906: 124.

Limnesia gentilis indica K. Viets, 1926: 378.

Material Examined

Australia: Northern Territory: 1 ♀, Lake Jabiru, Jabiru, 20 July 1994; 6 ♂, 5 ♀, 1 nymph, billabong Yellow Waters, Kakadu National Park, 21 July 1994.

Remarks

Unlike specimens from eastern Australia, which have red chitinated parts (Halik, 1941; personal observation), those of Northern Territory have brown chitinated parts.

Distribution

Previously reported from New South Wales (Halik, 1941) and Queensland (Smit, 1992). *L. lebangensis* has a very wide distribution, and is known from Taiwan, Singapore, Thailand, India, Pakistan, Sri Lanka and Indonesia.

Limnesia (Limnesia) longigenitalis Lundblad

Limnesia longigenitalis Lundblad, 1941a: 114;
Lundblad, 1947: 42; Smit, 1992: 95.

Material Examined

Australia: Western Australia: 4 ♂, 12 ♀, 2 nymphs, ditch pastoral land, Peaceful Bay, southwest of Denmark, 30 August 1994; 1 ♀, Lake Seppings, Albany, 31 August 1994.

Remarks

The females of this study measure 1188–1296 in length, the males 698–737 in length. Lundblad (1947) mentioned the following lengths: male 690, female 1345.

Distribution

Previously reported from Victoria (Lundblad, 1947) and New South Wales (Smit, 1992). In this study, the species has been found only in the southwestern part of Western Australia.

Limnesia (Limnesia) maceripalpis K.O. Viets

Limnesia maceripalpis K.O. Viets, 1975: 93; K.O. Viets, 1984: 421; Cook, 1986: 77.

Material Examined

Australia: Northern Territory: 1 ♀, Radon Springs, Kakadu National Park, 19 July 1994; 1 ♂, Baroalba Springs (Gubarra), Kakadu National Park, 20 July 1994; 2 ♂, 2 ♀, 1 nymph, Lake Jabiru, Jabiru, 20 July 1994; 2 ♂, pool Twin Falls, Kakadu National Park, 23 July 1994; 1 ♀, pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 2 ♂, 1 ♀, Southern Rockhole, Katherine Gorge National Park, 27 July 1994; 6 ♂, 3 ♀, plunge pool Edith Falls, Katherine Gorge National Park, 30 July 1994.

Western Australia: 1 ♀, Palm Pool, Millstream-Chichester National Park, 15 August 1994; 1 ♂, 3 ♀, pond Snake Creek, Millstream-Chichester National Park, 17 August 1994; 3 ♀, Ashburton River, at crossing with North West Coastal Highway, 18 August 1994; 3 ♀, 1 nymph, Fortescue River, at crossing with North West Coastal Highway, 18 August 1994.

Remarks

The largest male of this study measured 1320 in length, the largest female 1536. Cook (1986) gave the following measurements: males 760–851 and females 927–1075.

Distribution

Previously reported from Queensland (K.O. Viets, 1975; Cook, 1986) and the Northern Territory (K.O. Viets, 1984).

Limnesia (Limnesia) parasolida K.O. Viets

Figure 1

Limnesia parasolida K.O. Viets, 1984: 419; Cook, 1986: 76; Smit, 1992: 95.

Material Examined

Australia: Northern Territory: 4 ♂, 7 ♀, Radon Springs, Kakadu National Park, 19 July 1994; 8 ♂, 6 ♀, billabong Nourlangie Creek, Kakadu National Park, 20 July 1994; 3 ♂, 2 ♀, Lake Jabiru, Jabiru, 20 July 1994; 19 ♂, 24 ♀, 3 nymphs, Baroalba Springs (Gubarra), Kakadu National Park, 20 July 1994; 2 ♀, Mardugal Billabong, Kakadu National Park, 21 July 1994; 3 ♀, 5 nymphs, pond in Jim Jim Creek, at Jim Jim Crossing, Kakadu National Park, 22 July 1994; 1 ♀, Home Billabong, Kakadu National Park, 22 July 1994; 8 ♂, 15 ♀, pool near Jim Jim Falls, Kakadu National Park, 23 July 1994; 4 ♂, 2 ♀, 1 nymph, pond Jim Jim Creek, at Jim Jim campground, Kakadu National Park, 23 July 1994; 1 ♀, pool Twin Falls, Kakadu National Park, 23 July 1994; 1 ♀, Barramundie Creek, Kakadu National Park, 24 July 1994; 2 ♂, 5 ♀, 1 nymph, pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 14 ♂, 1 ♀, 3 nymphs, plunge pool Gunlom Falls, Kakadu National Park, 25 July 1994; 1 ♂, Southern Rockhole, Katherine Gorge National Park, 27 July 1994; 11 ♂, 9 ♀, 1 nymph, Lily Ponds Falls, Katherine Gorge National

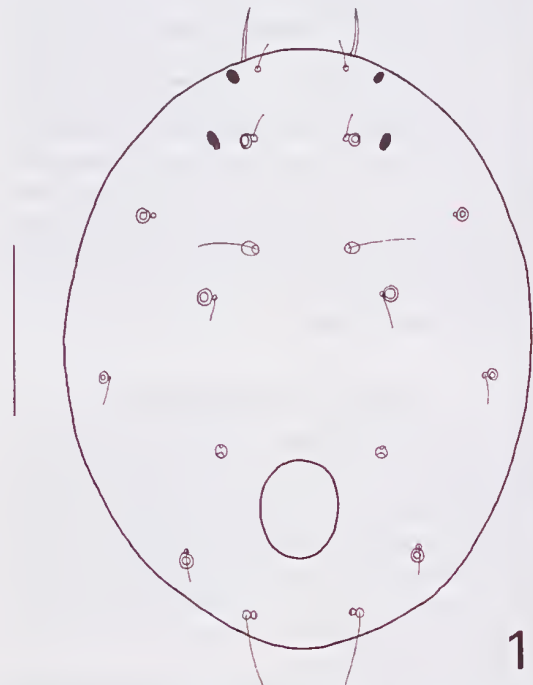


Figure 1 *Limnesia parasolida* K.O. Viets: 1, dorsal view, ♂. Scale line = 200 µm.

Park, 27 July 1994; 9 ♂, 6 ♀, 1 nymph, small stream, Butterfly Gorge, Katherine Gorge National Park, 27 July 1994; 2 ♂, 1 ♀, 1 nymph, Katherine River, near visitor's center, Katherine Gorge National Park, 28 July 1994; 1 ♀, pond Chinaman Creek, 16 km south of Katherine, 29 July 1994; 6 ♂, 7 ♀, 1 nymph, plunge pool Edith Falls, Katherine Gorge National Park, 30 July 1994; 3 ♂, 1 ♀, Douglas River, at Douglas Hot Springs, 1 August 1994; 1 ♂, 1 ♀, ponds Ormiston Gorge, Ormiston Gorge National Park, 6 August 1994; 3 ♂, waterhole Ormiston Gorge, Ormiston National Park, 6 August 1994.

Western Australia: 8 ♂, 26 ♀, 3 nymphs, Fortescue Falls (pool), Hamersley Range National Park, 11 August 1994; 5 ♂, 12 ♀, 12 nymphs, pond Dales Gorge, Hamersley Range National Park, 12 August 1994; 14 ♂, 12 ♀, 5 nymphs, pond Kalamina Gorge, near falls, Hamersley Range National Park, 13 August 1994; 2 ♂, streams originating in Chinderwariner Pool, Millstream-Chichester National Park, 15 August 1994; 4 nymphs, Palm Pool, Millstream-Chichester National Park, 15 August 1994; 2 nymphs, Deep Reach Pool, Millstream-Chichester National Park, 15 August 1994; 2 nymphs, western part Deep Reach Pool, Millstream-Chichester National Park, 16 August 1994; 2 ♂, 2 ♀, Python Pool, Millstream-Chichester National Park, 17 August 1994; 5 ♂, 1 ♀, Jones River, east of Roeburne, 17 August 1994; 3 ♂, 2 ♀, 2 nymphs, Fortescue River, at crossing with North West Coastal Highway, 18 August 1994; 2 ♂, Ashburton River, at crossing with North West Coastal Highway, 18 August 1994.

Remarks

In some populations, males and females possessing an aberrant number of acetabula, co-occur with specimens having the normal two pairs of three acetabula. The following aberrant numbers of acetabula have been recorded (males as well as females): 2+2, 2+3, 7+7 and 8+8. All these specimens are otherwise similar to *L. parasolida*, so I assigned them to that species. The number of acetabula is used for subgeneric splitting within the genus *Limnesia*, e.g. tetracetabulate species are assigned to *Tetralimnesia*. It is clear that the number of acetabula cannot be used for subgeneric splitting. Cook (1974) has pointed out the likelihood that unrelated species are lumped in subgenera of *Limnesia*.

Occasionally, the IV-leg-5 of *L. parasolida* has two stiff swimming setae. Cook (1986) mentioned the occurrence of only one stiff setae on this leg segment.

L. parasolida shows large variation in length. Females range from 320 to 1344 in length, the lower value belonging to a young female. Males ranged from 523 to 912. Cook (1986) gives the following

measurements: females 638–850, males 760–896. Small specimens usually have a short terminal seta on IV-leg-6, 77–84 in length. In larger specimens this seta measures 127–137. However, intermediate lengths do occur. It might be possible that more than one species is present, but morphological characters do not allow a separation.

Distribution

Previously reported from Northern Territory (Alice Springs area) (K.O. Viets, 1984) and Queensland (Cook, 1986; Smit, 1992). With the new records, it can be concluded that *L. parasolida* is a common species of the northern half of Australia.

Limnesia (Limnesia) rubra sp. nov.

Figures 2–4

Material Examined

Holotype

♂, plunge pool Edith Falls, Katherine Gorge National Park, Northern Territory, Australia, 30 July 1994 (NTM).

Paratypes

1 ♂, 1 ♀ (ZMA), 1 ♀ (NTM), same data as holotype.

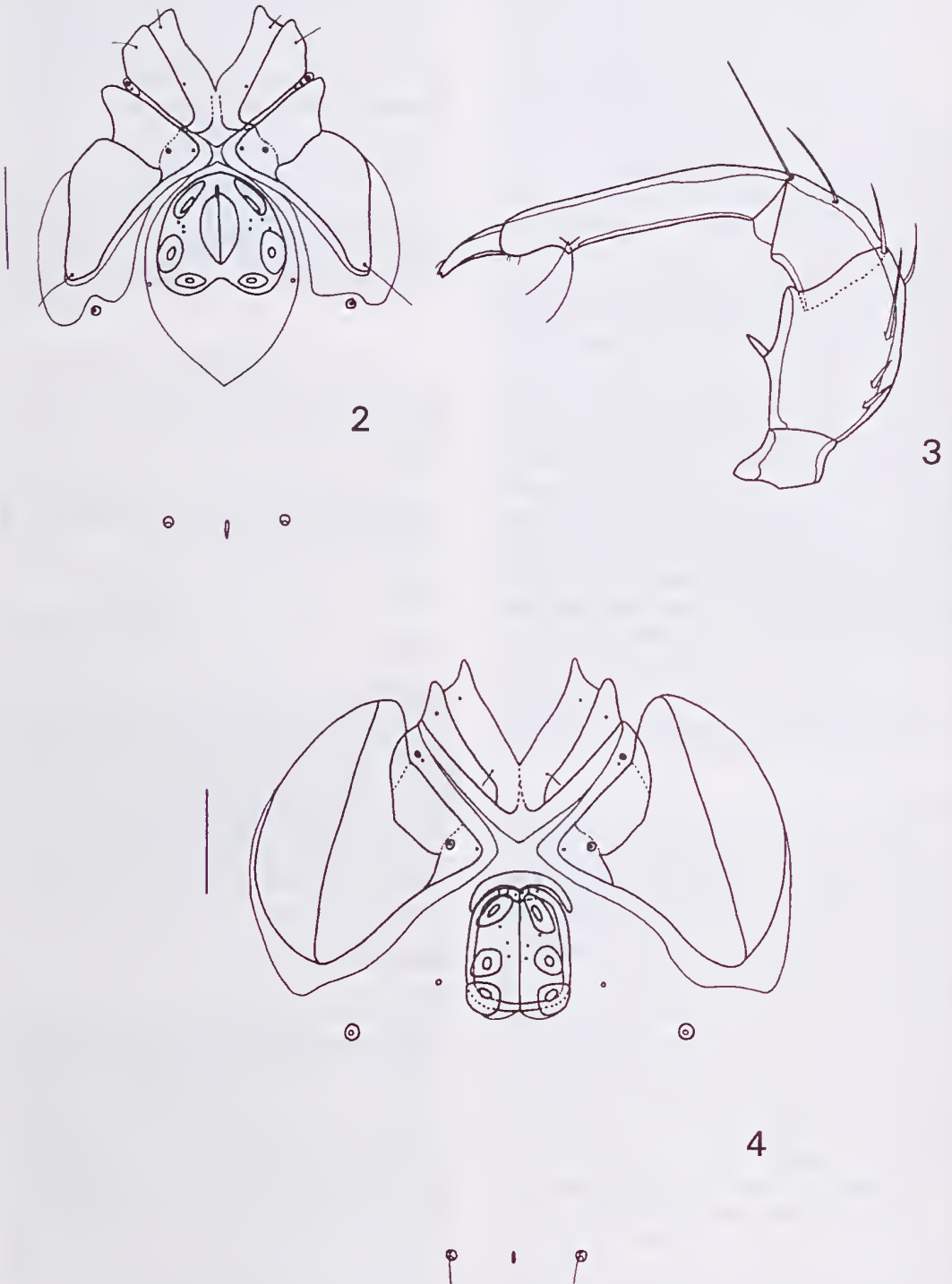
Diagnosis

Male acetabular plates forming a complete ring surrounding the gonopore, extensive secondary sclerotization around fourth coxal plates and genital field, first coxal plates fused medially, capitular bay deep, Glandula *Limnesiae* on third coxal plates and well separated from associated setae, peg-like seta on ventral margin of PII not on a tubercle, legs with swimming setae, chitinized parts coloured red.

Description

Male

Body 1067 (989) long and 902 (873) wide; chitinized parts coloured red. Integument smooth. Dorsum with an elongated platelet, 136 (136) in length. Capitular bay deep, longer than medial margins of first coxal plates. First coxal plates fused medially. Glandula *Limnesiae* on third coxal plates, well separated from the associated setae. Extensive secondary sclerotization around fourth coxal plates and genital field, and to a lesser extent medial of third coxal plates and posterior of first coxal plates. Gonopore 136 (120) long, completely surrounded by acetabular plates. Genital field with two pairs of three acetabula, the most anterior pair elongated. Excretory pore between associated glandularia. Lengths of PI–PV: 29, 144, 91, 206, 60.



Figures 2–4 *Limnesia rubra* sp. nov., holotype ♂: 2, ventral view; 3, palp ♂; paratype ♀: 4, ventral view. Scale lines: 2, 4 = 200 µm; 3 = 100 µm.

Peg-like seta of ventral margin of PII not on a tubercle; setal tubercles of PIV small. Lengths of I-leg-4-6: 142, 166, 132. Lengths of IV-leg-4-6: 216, 233, 214; distal seta of IV-leg-6 142 long. III-leg-4 with one, III-leg-5 with nine, IV-leg-4 with four and IV-leg-5 with two long swimming setae.

Female

Body 1212–1397 long and 1018–1096 wide. Dorsum with an elongated platelet, 184–213 long. First coxal plates fused medially. A strip of secondary sclerotization along coxal plates. Gonopore 194 long. Genital field with two pairs of three acetabula. A genital sclerite 204 in width, anterior of genital field. Excretory pore between associated glandularia. Palp as in male; lengths of PI-PV: 36, 146, 118, 233, 34. Lengths of I-leg-4-6: 166, 194, 156. Lengths of IV-leg-4-6: 242, 272, 252; length of distal seta of IV-leg-6 146. III-leg-4 with one, III-leg-5 with eight, IV-leg-4 with four and IV-leg-5 with three long swimming setae.

Remarks

The new species belongs to the *solida*-group (*L. australica* Lundblad, *L. parasolida*, *L. solida*) of Cook (1986). The only other species of that group with the Glandula Limnesiae well separated from the associated setae, *L. parasolida*, has the gonopore as large as the genital field and less extensive secondary sclerotization. Further, *L. rubra* has long swimming setae (as in *australica*), while *parasolida* and *solida* have stiff swimming setae. The combination of long swimming setae and well separated Glandula Limnesiae and associated setae will separate the female from other females of the *solida*-group.

Etymology

Named for its conspicuous red colour.

Limnesia (Limnesia) solida Lundblad Figure 5

Limnesia solida Lundblad, 1947: 46; K.O. Viets, 1975: 93; Smit, 1992: 95.

Material Examined

Australia: Northern Territory: 1 ♂, Home Billabong, Kakadu National Park, 22 July 1994; 1 ♀, Jim Jim Billabong, at crossing with Kakadu Highway, Kakadu National Park, 22 July 1994; 2 ♂, pond Jim Jim Creek, at Jim Jim campground, Kakadu National Park, 23 July 1994; 2 ♂, pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 1 ♂, 3 ♀, Kambolgie Creek, Kakadu National Park, 26 July 1994; 1 ♀, Southern Rockhole, Katherine Gorge National Park, 27 July 1994; 4 ♂, 3 ♀, 1 nymph, billabong near Douglas Hot Springs, 1 August 1994; 6 ♂, 14 ♀, 1 nymph,

waterhole Kantju Gorge, Ayers Rock, 4 August 1994; 1 ♀, ponds Ormiston Gorge, Ormiston Gorge National Park, 6 August 1994.

Western Australia: 7 ♂, 9 ♀, 1 nymph, Fortescue Falls (pool), Hamersley Range National Park, 11 August 1994; 2 ♂, 7 ♀, 5 nymphs, Circular Pool, Hamersley Range National Park, 12 August 1994; 1 ♀, pond Dales Gorge, Hamersley Range National Park, 12 August 1994; 3 ♂, 2 ♀, 1 nymph, pond Knox Gorge, Hamersley Range National Park, 13 August 1994; 9 ♂, 17 ♀, 1 nymph, pool Joffre Gorge, Hamersley Range National Park, 13 August 1994; 11 ♂, 5 ♀, 2 nymphs, pond Kalamina Gorge, near falls, Hamersley Range National Park, 13 August 1994; 2 ♀, Handrail pool, Weena Gorge, Hamersley Range National Park, 14 August 1994; 10 ♂, 15 ♀, pond Hancock Gorge, Hamersley Range National Park, 14 August 1994; 8 ♂, 6 ♀, 3 nymphs, Palm Pool, Millstream-Chichester National Park, 15 August 1994; 2 ♀, 1 nymph, small pond near Crossing Pool, Millstream-Chichester National Park, 16 August 1994; 1 ♀, Crossing Pool, Millstream-Chichester National Park, 16 August 1994; 11 ♂, 4 ♀, Python Pool, Millstream-Chichester National Park, 17 August 1994; 18 ♂, 27 ♀, 1 nymph, McKenzie Spring, Millstream-Chichester National Park, 17 August 1994; 14 ♂, 6 ♀, pond Snake Creek, Millstream-Chichester National Park, 17 August 1994; 5 ♂, 4 ♀, 1 nymph, Jones River, east of Roeburne, 17 August 1994; 1 ♂, 1 ♀, 2 nymphs, Fortescue River, at crossing with North West Coastal Highway, 18 August 1994; 1 ♂, 17 ♀, Ashburton River, at

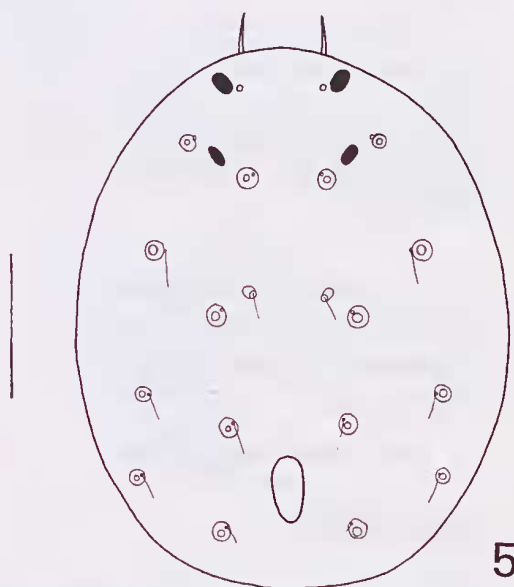


Figure 5 *Limnesia solida* Lundblad, dorsal view, ♂. Scale line = 200 µm.

crossing with North West Coastal Highway, 18 August 1994.

Remarks

According to Cook (1986) *L. solida* and *L. parasolida* differ in the number of stiff swimming setae on IV-leg-5 (*solida* with two setae and *parasolida* with one). However, the number of stiff setae on IV-leg-5 varies in both species from 1–2, and can therefore not be used to separate the two species. The two species are easily separated by the platelet on the dorsum, which is larger and more rounded in *L. parasolida* (Figure 1), and the distance between the Glandula Limnesiae and the associated seta (large in *parasolida*, short in *solida*). In contradiction to Smit (1992), the male does have a platelet on the dorsal shield (Figure 5), 68–86 long. Males of *L. parasolida* have the gonopore as long as the genital field, in *L. solida* the gonopore is distinctly shorter than the genital field.

The seta associated with coxoglandularia 2 of *L. solida* are not always closer to the genital field (as stated by Cook), but occasionally halfway between the genital field and the coxoglandularia 2. Males of *solida* sometimes show some secondary sclerotization posterior of the genital field and fourth coxal plates. Males of this study are 737–941 in length, the long seta of IV-leg-6 measured 62–98 in length. Females measured 902–1260 in length. The nymphs of the two species can be separated with the platelet on the dorsal shield, which is 17–33 long in *L. solida* and 48–70 in *L. parasolida*.

Distribution

A widespread species in Australia, previously reported from Victoria (only one record, the holotype) and Queensland (K.O. Viets, 1975; Smit, 1992). The species is much more common in the Northern Territory and Western Australia compared to Queensland and Victoria. So far, no records are known from the southwestern part of Western Australia.

Genus *Physolimnesia* Halík

Centrolimnesia (*Physolimnesia*) Halík, 1940: 21.

Physolimnesia Halík: Lundblad, 1941b: 365.

Physolimnesia katherine sp. nov.

Figures 6–10

Material Examined

Holotype

♂, Southern Rockhole, Katherine Gorge National Park, Northern Territory, Australia, 27 July 1994 (NTM).

Paratypes

3 ♂, 2 ♀ (NTM), 2 ♂, 2 ♀ (WAM), 2 ♂, 2 ♀, 1 nymph (ZMA), same data as holotype.

Diagnosis

Male and female with four pairs of large acetabula, gonopore much shorter than length of genital field; third and fourth legs of male modified. Seta on ventral margin of second palp segment on a tubercle; fourth palp segment with distinct setal tubercles.

Description

Male

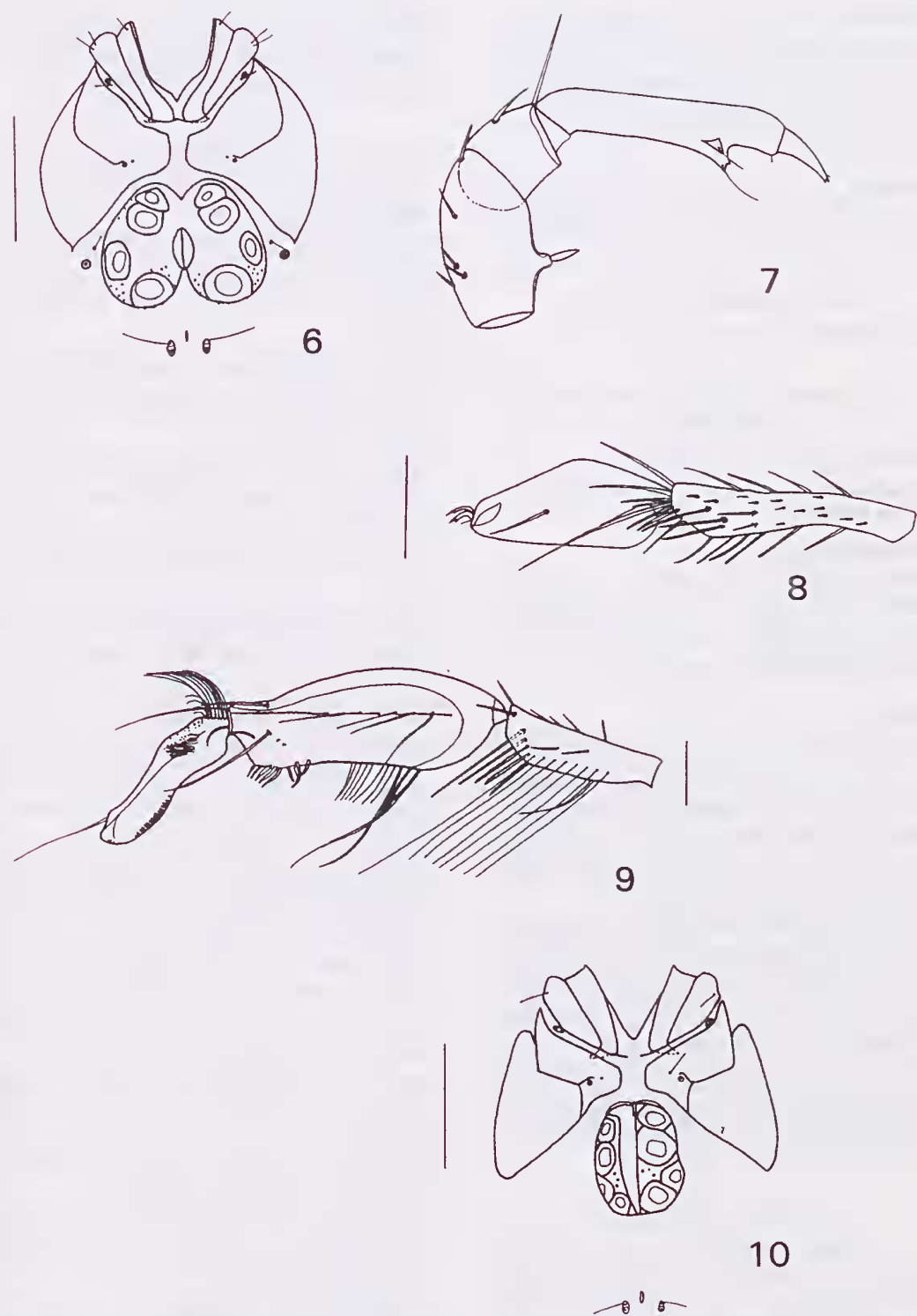
Body 776 (630–863) long and 562 (495–592) wide. Dorsal platelets absent. First coxal plates not fused medially, but secondary sclerotization present between first coxal plates. Glandula Limnesiae medial of suture line of third and fourth coxal plates; associated setae close to Glandula Limnesiae. Genital field with four pairs of large acetabula. Gonopore 77 long, much shorter than genital field. Excretory pore between associated glandularia. Measurements of PI-PV: 19, 125, 89, 175, 50. Seta on ventral margin of PII on a tubercle, seta longer than tubercle. Ventral margin of PIV with distinct setal tubercles. Third and fourth legs modified. III-leg-6 expanded and flattened, with one seta on medial side. IV-leg-5 large, with three long, thick setae and eight short, fine setae on ventral margin, a row of hyaline setae on anteroventral margin, 11 (11–14) setae on medial side and three long setae on anterior part of segment; distal margin with one curved seta. IV-leg-6 ventrally with a row of grooves, anterodorsal margin with a group of curved setae, a group of fine setae on medial side and anteroposteriorly with a 161 long seta. Measurements of first, third and fourth legs: I-leg-4-6: 154, 146, 144, I-leg-6 with an undulating ventral margin. III-leg-4-6: 240, 236, 199. IV-leg-4-6: 228, 388, 248. Second, third and fourth legs with swimming setae.

Female

Body 553–1018 long and 456–795 wide. Dorsal platelets absent. Position of Glandula Limnesiae as in male. Genital field with two pairs of four, large acetabula. Palp as in male. Measurements of PI-PV: 22, 125, 60, 173, 53. Measurements of I-leg-4-6: 115, 125, 120. Measurements of IV-leg-4-6: 211, 223, 218; IV-leg-6 with a 132 long seta. Third and fourth legs with swimming setae.

Remarks

Now that the second *Physolimnesia* species is known, the diagnosis of the genus has to be altered: genital field with three or four pairs of acetabula. The new species differs from



Figures 6–10 *Physolimnesia katherine* sp. nov., paratype ♂: 6, ventral view; holotype ♂: 7, palp; 8, III-leg-5-6; 9, IV-leg-4-6; paratype ♀: 10, ventral view. Scale lines: 6, 10 = 200 µm; 7, 8, 9 = 100 µm.

Physolimnesia australis (Halík) in having four pairs of large acetabula (three in *P. australis*), and a more slender III-leg-6 of the male. The row of 11–14 seta on the medial side of IV-leg-5 is absent in *australis*, but in general the modified third and fourth legs of the two species are remarkably similar.

Etymology

Named after the Katherine River, which is near the type locality; the name is a noun in apposition.

Genus *Timmsilimnesia* K.O. Viets

Timmsilimnesia K.O. Viets, 1984: 422.

Timmsilimnesia inga (K.O. Viets), new combination

Limnesia inga K.O. Viets, 1975: 94.

Timmsilimnesia prehensens K.O. Viets, 1984: 422.

New synonymy.

Material Examined

Australia: Northern Territory: 1 ♀, 1 nymph, billabong Nourlangie Creek, Kakadu National Park, 20 July 1994; 9 ♂, 5 ♀, small billabong, Gunlon, Kakadu National Park, 25 July 1994; 1 ♀, 5 nymphs, Manton Dam, 1 August 1994.

Remarks

Cook (1986) was the first to recognise that the two species were morphologically similar, although he did not synonymize the two species. Now that males of *Timmsilimnesia prehensens* and females of *Limnesia inga* are collected on the same location, it is clear that they are conspecific. Therefore, the new name of the species must be *Timmsilimnesia inga* (K.O. Viets).

Both male and female were hitherto only known from holotypes each based on one sex, collected in Northern Territory and Queensland respectively. The males from this study measure 1200–1464 in length and 996–1284 in width, the females measure 1236–2280 in length and 1080–1944 in width. No length and width were given by K.O. Viets (1984) for the male, the females are much larger than the holotype female from Queensland. The colour of the chitinized parts is not red, as reported by K.O. Viets (1975), but yellow.

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